Installation Manual
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Micro Motion®
Model 2400S Transmitters

Installation Manual

Micro Motion®

EMERSON™
Process Management

Contents

Chapter 1
Before You Begin

1.1 Overview

This chapter provides an orientation to the use of this manual. This manual describes the procedures required to install the following transmitters:

- Model 2400S transmitter with analog outputs
- Model 2400S transmitter with PROFIBUS-DP
- Model 2400S transmitter with DeviceNet™

The 2400S Analog transmitter can be approved for Exe or Exi installation in Zone 1, or for installation in Zone 2. If you are installing your transmitter in a hazardous area, be sure the transmitter is approved for that area.

1.2 Safety

Safety messages are provided throughout this manual to protect personnel and equipment. Read each safety message carefully before proceeding to the next step.

⚠ WARNING

Improper installation in a hazardous area can cause an explosion.

For information about hazardous applications, refer to Micro Motion hazardous area installation instructions, shipped with the transmitter or available from the Micro Motion web site.

⚠ WARNING

Hazardous voltage can cause severe injury or death.

Make sure power is disconnected before installing transmitter.

⚠ CAUTION

Improper installation could cause measurement error or flowmeter failure.

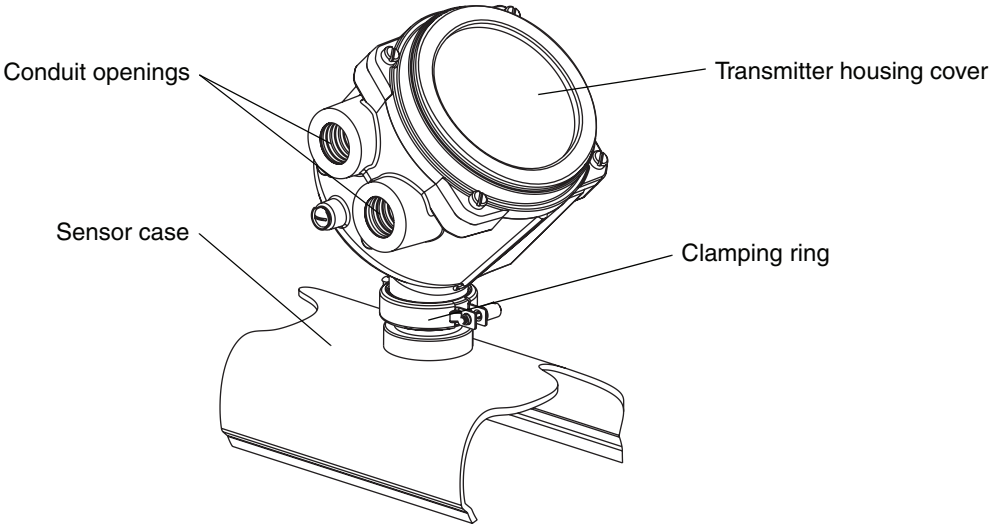
Follow all instructions to ensure transmitter will operate correctly.

1.3 Flowmeter components

The Model 2400S transmitter is mounted on a Micro Motion sensor. The transmitter and sensor together comprise the Micro Motion flowmeter.

Figure 1-1 provides a view of the Model 2400S transmitter mounted on a sensor.

Figure 1-1 Model 2400S transmitter



1.4 Transmitter installation overview

The Model 2400S transmitter component is mounted integrally with the sensor and grounded via the sensor. To install and ground the sensor, see the sensor documentation.

Additional transmitter installation steps are documented in this manual:

- Rotate the transmitter on the sensor (optional) – see Chapter 2
- Rotate the user interface module on the transmitter (optional) – see Chapter 2
- Wire and ground the transmitter's power supply – see Chapter 2
- Wire the transmitter I/O:
  - For the Model 2400S Analog transmitter, see Chapter 3
  - For the Model 2400S PROFIBUS-DP and DeviceNet transmitters, see Chapter 4

1.5 Flowmeter documentation

Table 1-1 lists documentation sources for other required information.

Table 1-1 Flowmeter documentation resources

Topic	Document
Sensor installation	Sensor documentation shipped with sensor
Hazardous area installation	See the approval documentation shipped with the transmitter, or download the appropriate documentation from the Micro Motion web site (www.micromotion.com)
Transmitter configuration Transmitter startup and use Transmitter troubleshooting	• *Micro Motion® Model 2400S Transmitters with Analog Outputs: Configuration and Use Manual* • *Micro Motion® Model 2400S Transmitters with PROFIBUS-DP: Configuration and Use Manual* • *Micro Motion® Model 2400S Transmitters with DeviceNet™: Configuration and Use Manual*

Chapter 2
Transmitter Orientation and Power Supply

2.1 Overview

This chapter describes:

- Rotating the transmitter on the sensor (optional)
- Rotating the user interface module on the transmitter (optional)
- Power supply requirements and wiring

2.2 Moisture protection

When rotating or wiring the transmitter, guard against condensation or excessive moisture inside the transmitter housing. Be sure that the conduit openings are completely sealed after all installation and wiring procedures have been performed.

⚠ CAUTION

Condensation or excessive moisture entering the transmitter could damage the transmitter and result in measurement error or flowmeter failure.

To reduce the risk of measurement error or flowmeter failure:

- Do not mount the sensor so that the conduit openings on the transmitter point upward.
- Ensure the integrity of gaskets and O-rings.
- Grease the O-rings every time the transmitter housing is opened and closed.
- Install drip legs on conduit or cable.
- Seal the conduit openings.
- Fully tighten all covers.

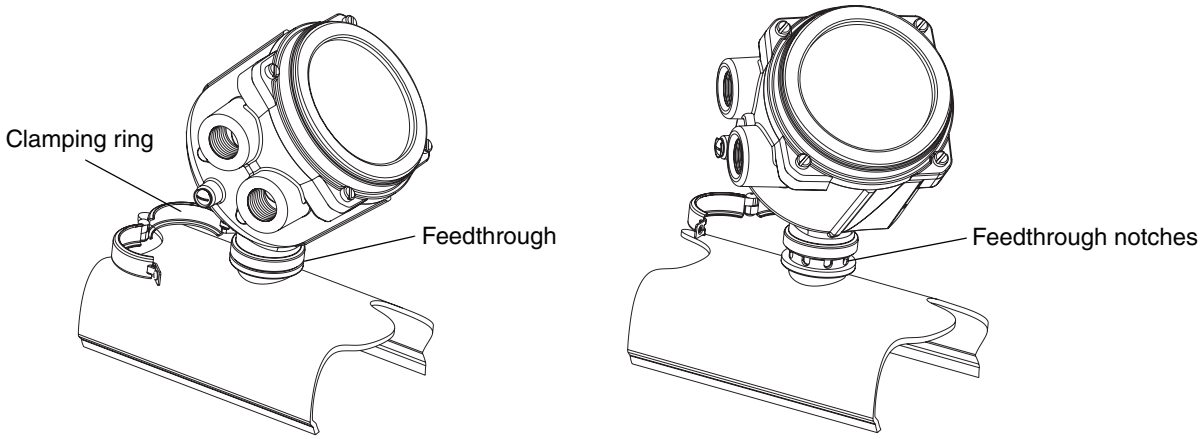
2.3 Rotating the transmitter on the sensor (optional)

For easier access to the user interface or the wiring terminals, the transmitter can be rotated on the sensor in 45° increments, for eight different orientations.

To rotate the transmitter on the sensor:

1. Referring to Figure 2-1, unscrew the clamp that holds the transmitter to the feedthrough.
2. Gently lift the transmitter on the feedthrough until it disengages from the notches on the feedthrough. You will not be able to remove the transmitter completely.
3. Rotate the transmitter to the desired position.
4. Lower the transmitter, sliding it onto the notches on the feedthrough.
5. Replace the clamp and tighten the screw.

Figure 2-1 Rotating the transmitter on the sensor



⚠ CAUTION

Excessive rotation of the housing on the feedthrough can cause wiring damage and result in measurement error or flowmeter failure.

To reduce the risk of damaging internal wiring, do not rotate the housing more than 360°. You can rotate the transmitter either clockwise or counter-clockwise to reach the desired position.

2.4 Rotating the user interface module on the transmitter (optional)

For easier access, the user interface module (whether or not the transmitter has an LCD display) can be rotated on the transmitter up to 360° in 90° increments.

To rotate the user interface module on the transmitter:

1. Remove power from the unit.

⚠ WARNING

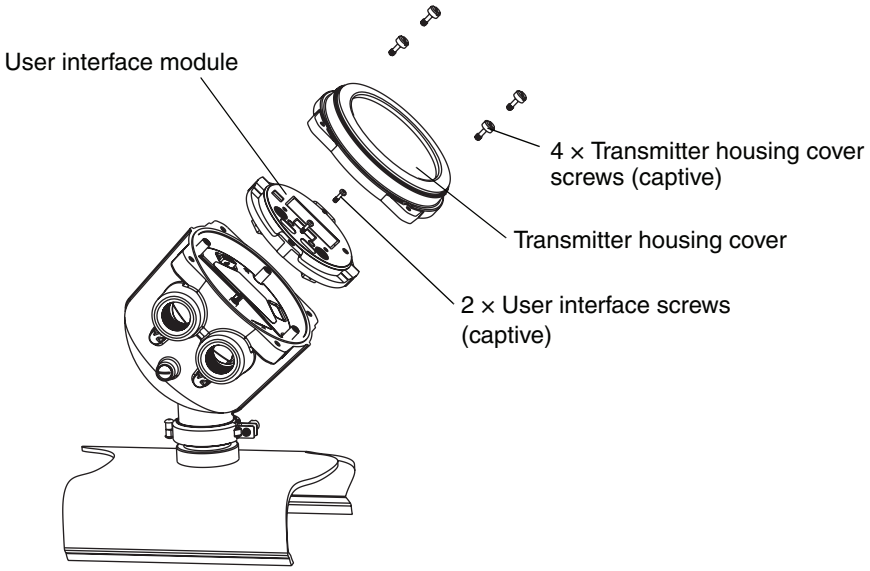
Removing the transmitter housing cover in a hazardous area while the transmitter is powered up can cause an explosion.

To avoid the risk of an explosion, remove power from the transmitter before removing the transmitter housing cover.

2. Referring to Figure 2-2, remove the transmitter housing cover and user interface module:
   a. Loosen the four transmitter housing cover screws.
   b. Remove the transmitter housing cover.
   c. Loosen the two user interface screws.
   d. Gently lift the user interface module, disengaging it from the user interface connector on the transmitter.

3. On the back of the user interface module, four user interface connectors are provided. Rotate the user interface module to the desired position and plug it into the user interface connector on the transmitter. (See Figure 2-3 for another view of the user interface connector on the transmitter.)
4. Tighten the user interface screws.
5. Replace the transmitter housing cover and tighten the transmitter housing cover screws.
6. Restore power to the transmitter if required.

Figure 2-2 Rotating the user interface module on the transmitter



2.5 Power supply requirements

Model 2400S Analog and Model 2400S PROFIBUS-DP transmitters can accept either AC or DC power. The transmitter automatically recognizes the source voltage. Power supply requirements for these transmitter models are listed in Table 2-1.

Table 2-1 Power supply requirements

	Power type	
Transmitter	**AC**	**DC(1)**
Model 2400S Analog Model 2400S PROFIBUS-DP	• 85–265 VAC • 50/60 Hz • 4 watts typical, 7 watts maximum	• 18–100 VDC • 4 watts typical, 7 watts maximum

(1) These requirements assume a single transmitter per cable. Connecting multiple transmitters to a single cable should generally be avoided.

The Model 2400S DeviceNet transmitter is powered from the DeviceNet network per the DeviceNet specification. There is no need to connect separate power-supply wiring for the Model 2400S DeviceNet transmitter. Skip to Chapter 4.

2.5.1 DC power requirements for Model 2400S Analog and PROFIBUS-DP transmitters

If you are using DC power with a Model 2400S Analog or PROFIBUS-DP transmitter, the following requirements apply:

- At startup, the transmitter power source must provide a minimum of 1 A of short-term current per transmitter.
- Length and conductor diameter of the power cable must be sized to provide 18 VDC minimum at the power terminals, at a load current of 0.5 A. To size the cable, refer to Table 2-2 and use the following formula as a guideline:

$$\text{MinimumSupplyVoltage} = 18\text{V} + (\text{CableResistance} \times \text{CableLength} \times 0.5\text{A})$$

Table 2-2 Typical power cable resistances at 68 °F (20 °C)

Gauge	Resistance(1)
14 AWG	0.0050 Ω/foot
16 AWG	0.0080 Ω/foot
18 AWG	0.0128 Ω/foot
20 AWG	0.0204 Ω/foot
2,5 mm^2	0,0136 Ω/meter
1,5 mm^2	0,0228 Ω/meter
1 mm^2	0,0340 Ω/meter
0,75 mm^2	0,0460 Ω/meter
0,5 mm^2	0,0680 Ω/meter

(1) These values include the resistance of both high and low conductors in a cable.

Example The transmitter is mounted 350 feet from a DC power supply. If you want to use 16 AWG cable, calculate the required voltage at the DC power supply as follows:

$$\text{MinimumSupplyVoltage} = 18\text{V} + (\text{CableResistance} \times \text{CableLength} \times 0.5\text{A})$$

$$\text{MinimumSupplyVoltage} = 18\text{V} + (0.0080\ \text{Ohms/ft} \times 350\ \text{ft} \times 0.5\text{A})$$

$$\text{MinimumSupplyVoltage} = 19.4\text{V}$$

2.6 Wiring the power supply

Note: This procedure is required only for Model 2400S Analog and PROFIBUS-DP transmitters.

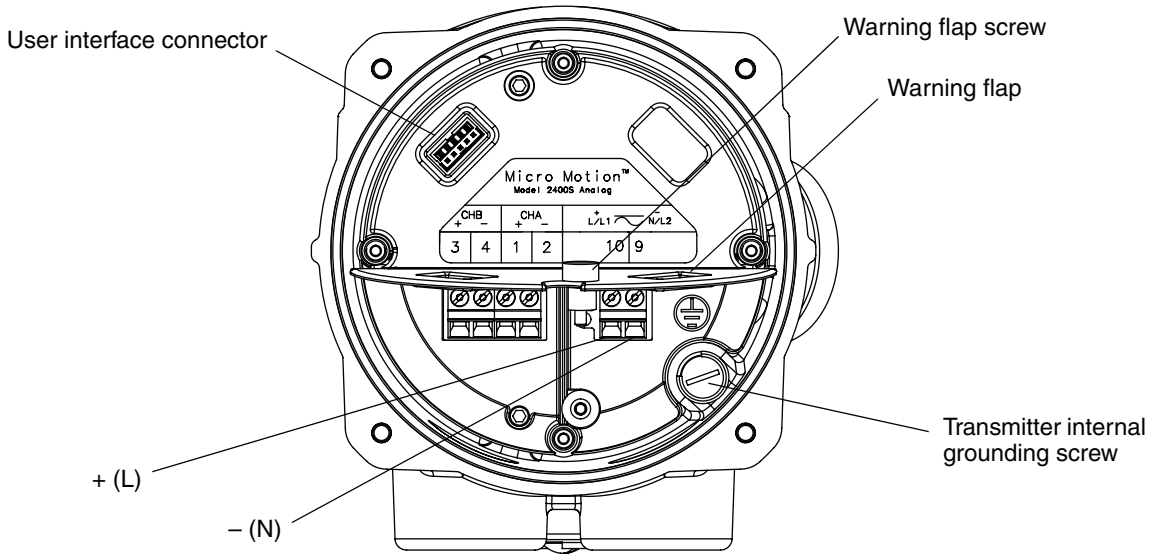
To wire the power supply:

1. Remove the transmitter housing cover and user interface module as described in Section 2.4.
2. Unscrew the warning flap screw and raise the warning flap. Figure 2-3 shows the warning flap in the open position.
3. Connect the power supply wires to terminals 9 and 10, as shown in Figure 2-3.
4. Ground the power supply to the transmitter's internal grounding screw, shown in Figure 2-3.
5. Lower the warning flap and tighten the warning flap screw.

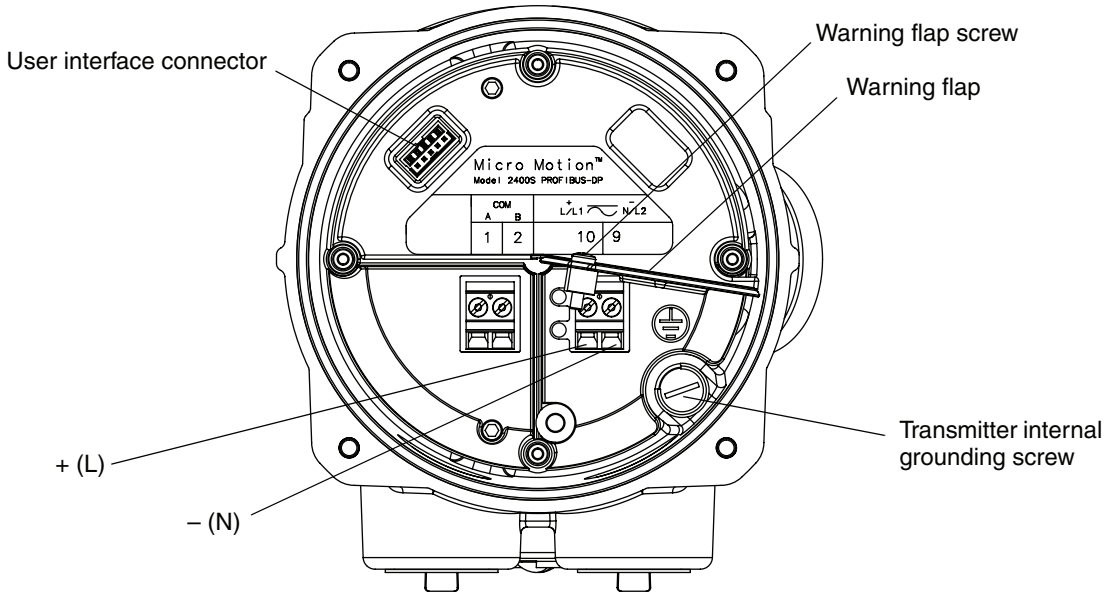
A user-supplied switch may be installed in the power supply line. For compliance with low-voltage directive 73/23/EEC (European installations), a switch in close proximity to the transmitter is required.

Figure 2-3 Wiring the transmitter power supply

Model 2400S Analog transmitter



Model 2400S PROFIBUS-DP transmitter



Chapter 3
I/O Wiring – Model 2400S Analog Transmitters

3.1 Overview

This chapter describes how to wire I/O for Model 2400S Analog transmitters.

Note: To wire I/O for Model 2400S PROFIBUS-DP and DeviceNet transmitters, see Chapter 4.

The 2400S Analog transmitter can be approved for Exe or Exi installation in Zone 1, or for installation in Zone 2. If you are installing your transmitter in a hazardous area, be sure the transmitter is approved for that area. It is the user's responsibility to verify that the specific installation meets the local and national safety requirements and electrical codes.

3.2 Moisture protection

When rotating or wiring the transmitter, guard against condensation or excessive moisture inside the transmitter housing. Be sure that the conduit openings are completely sealed after all installation and wiring procedures have been performed.

⚠ CAUTION

Condensation or excessive moisture entering the transmitter could damage the transmitter and result in measurement error or flowmeter failure.

To reduce the risk of measurement error or flowmeter failure:

- Do not mount the sensor so that the conduit openings on the transmitter point upward.
- Ensure the integrity of gaskets and O-rings.
- Grease the O-rings every time the transmitter housing is opened and closed.
- Install drip legs on conduit or cable.
- Seal the conduit openings.
- Fully tighten all covers.

3.3 I/O options

Table 3-1 lists the options for the transmitter's two I/O channels. Before wiring Channel B, ensure that you know how it will be configured. For information on configuring Channel B for function and power, see the manual entitled *Micro Motion® Model 2400S Transmitters with Analog Outputs: Configuration and Use Manual*.

Table 3-1 Terminal configuration options

Channel	Terminals	Function	Power[1]	Comm
A	1 & 2	mA	Internal[2] or external	HART/Bell 202
B	3 & 4	Frequency[2]	Internal[2] or external	None
		mA	Internal or external	None
		Discrete output	Internal or external	None
		Discrete input	Internal or external	None

(1) For transmitters with Zone 1 Exi approval, I/O power is external only.
(2) Factory default.

3.4 Wiring the outputs (Zone 1 Exe and Zone 2)

Note: For wiring instructions for Zone 1 Exi transmitters, see Section 3.5.

⚠ WARNING

Hazardous voltage can cause severe injury or death.

To avoid the risk of hazardous voltage, shut off the power before wiring the transmitter outputs.

⚠ WARNING

A transmitter that has been improperly wired or installed in a hazardous area could cause an explosion.

To avoid the risk of an explosion:

- Make sure the transmitter is wired to meet or exceed local code requirements.
- Install the transmitter in an environment that complies with the classification tag on the transmitter. See Appendix A.

To wire the outputs:

1. Remove the transmitter housing cover and user interface module. See Section 2.4 for instructions.
2. Wire the outputs according to the appropriate wiring diagram:
   - For mA output wiring diagrams, see Section 3.4.1.
   - For frequency output wiring diagrams, see Section 3.4.2.
   - For discrete output wiring diagrams, see Section 3.4.3.
   - For a discrete input wiring diagram, see Section 3.4.4.
3. Replace the user interface module and transmitter housing cover.

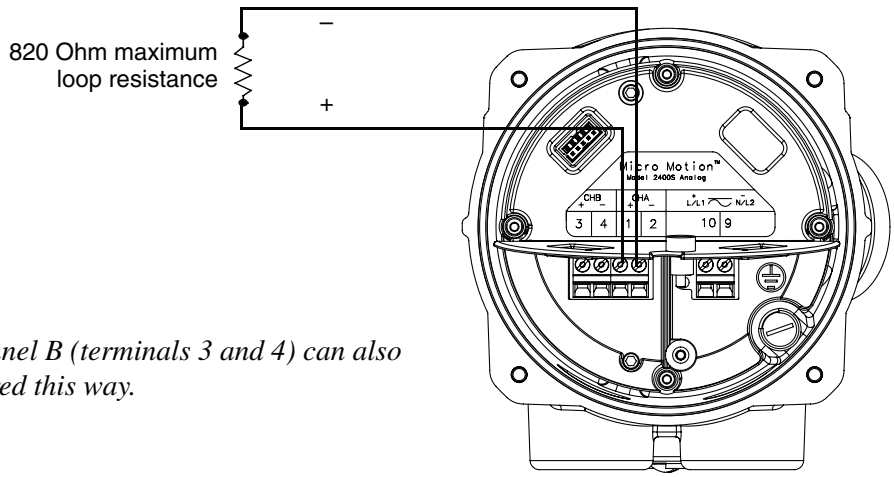
3.4.1 mA output wiring

The wiring diagrams in this section are examples of proper wiring for the Model 2400S mA output. The following options are shown:

- Internal power:
  - Basic mA output wiring – Figure 3-1
  - HART/analog single-loop wiring – Figure 3-2
- External power:
  - Basic mA output wiring – Figure 3-3
  - HART/analog single-loop wiring – Figure 3-4
- HART multidrop wiring, internal or external power – Figure 3-6

Note: If you plan to configure the transmitter to poll an external temperature or pressure device, you must wire the mA output to support HART communications. You may use either HART/analog single-loop wiring or HART multidrop wiring.

Figure 3-1 Basic mA output wiring – Internal power



Note: Channel B (terminals 3 and 4) can also be configured this way.

Figure 3-2 HART/analog single-loop wiring – Internal power

For analog communications:
- 820 Ohm maximum loop resistance

For HART communications:
- 600 Ohm maximum loop resistance
- 250 Ohm minimum loop resistance

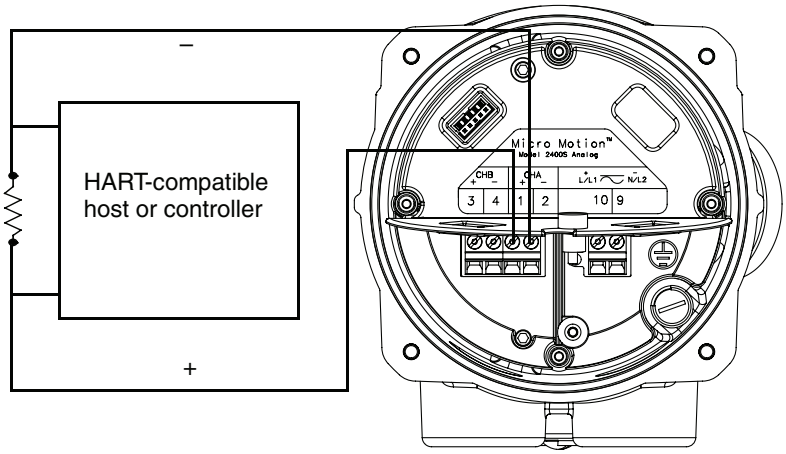
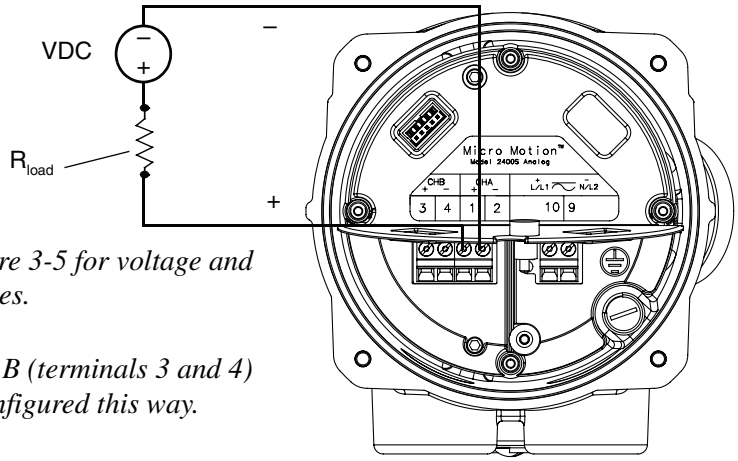


Figure 3-3 Basic mA output wiring – External power



Note: See Figure 3-5 for voltage and resistance values.

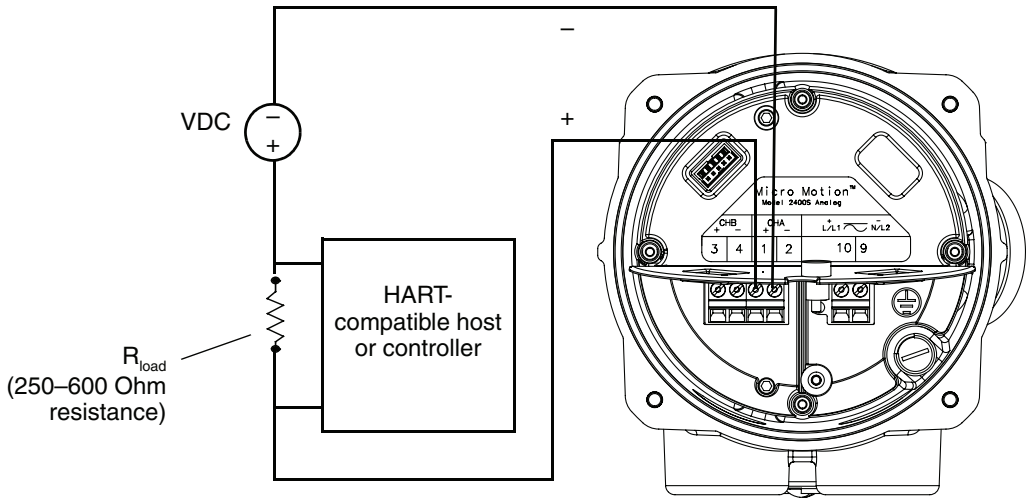
Note: Channel B (terminals 3 and 4) can also be configured this way.

⚠ CAUTION

Excessive current will damage the transmitter.

Do not exceed 36 VDC input. Terminal current must be less than 500 mA.

Figure 3-4 HART/analog single-loop wiring – External power



Note: See Figure 3-5 for voltage and resistance values.

Figure 3-5 Required external voltage versus mA load resistance

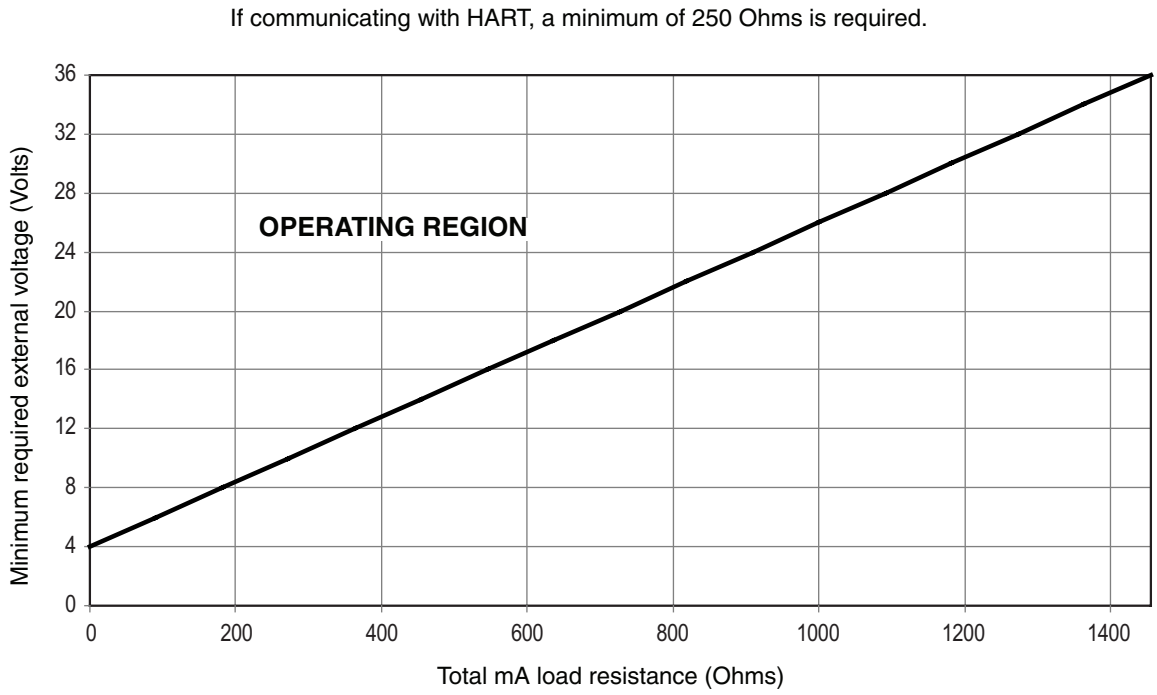
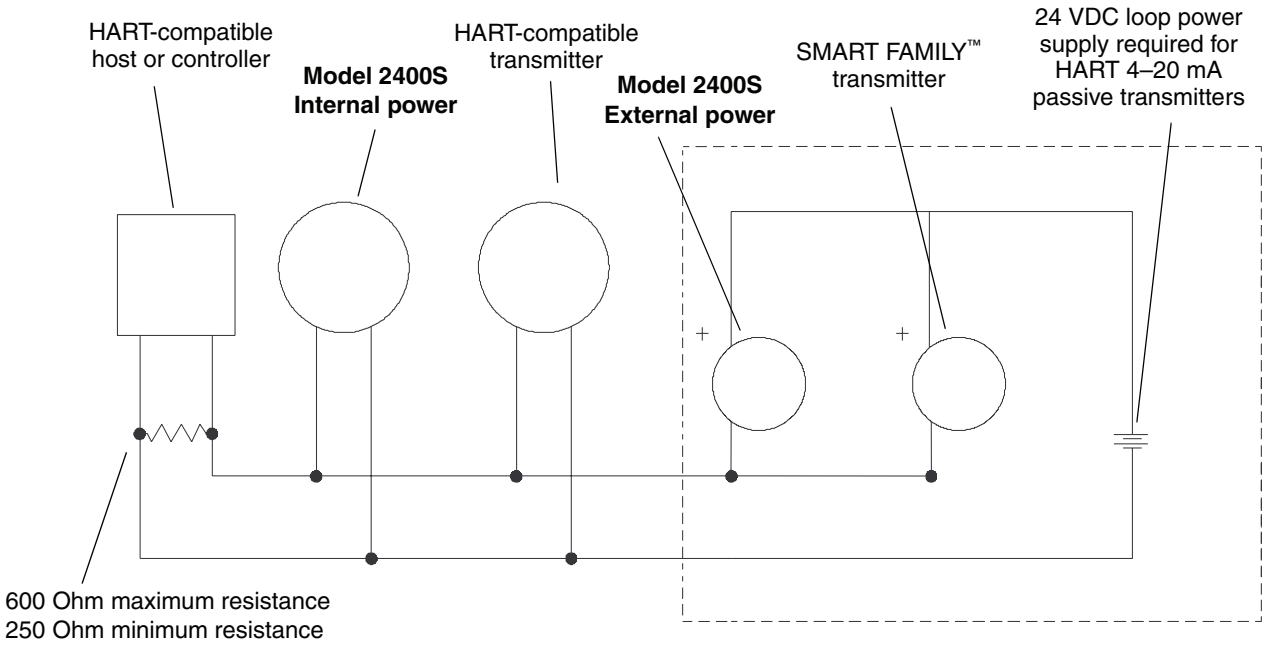


Figure 3-6 HART multidrop wiring – Internal or external power



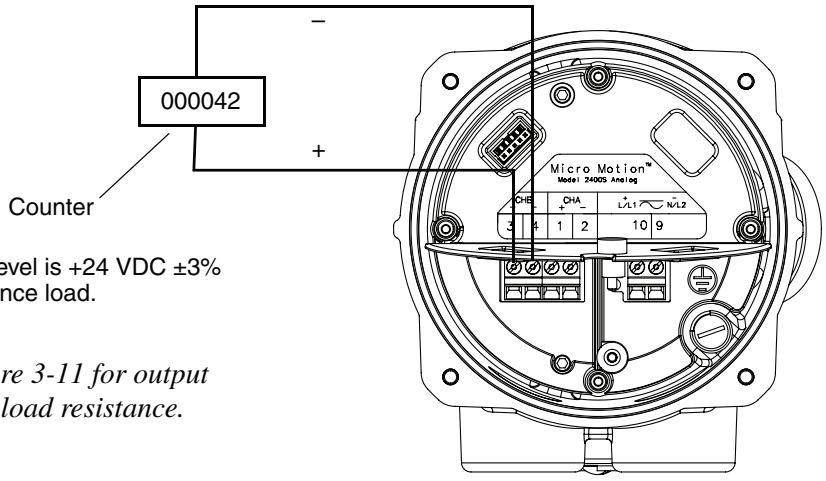
Note: For optimum HART communication, make sure the output loop is single-point-grounded to an instrument-grade ground.

3.4.2 Frequency output wiring

Frequency output wiring depends on whether you will use internal or external power. The following diagrams are examples of proper wiring for these configurations:

- Internal power – Figure 3-7
- External power – Figure 3-8

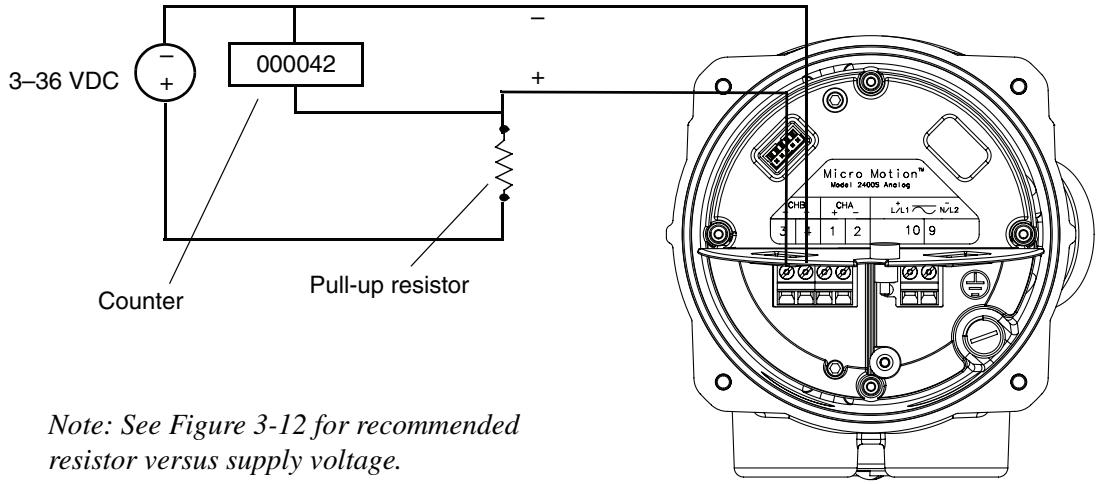
Figure 3-7 Frequency output wiring – Internal power



Output voltage level is +24 VDC ±3% with high resistance load.

Note: See Figure 3-11 for output voltage versus load resistance.

Figure 3-8 Frequency output wiring – External power



Note: See Figure 3-12 for recommended resistor versus supply voltage.

⚠ CAUTION

Excessive current will damage the transmitter.

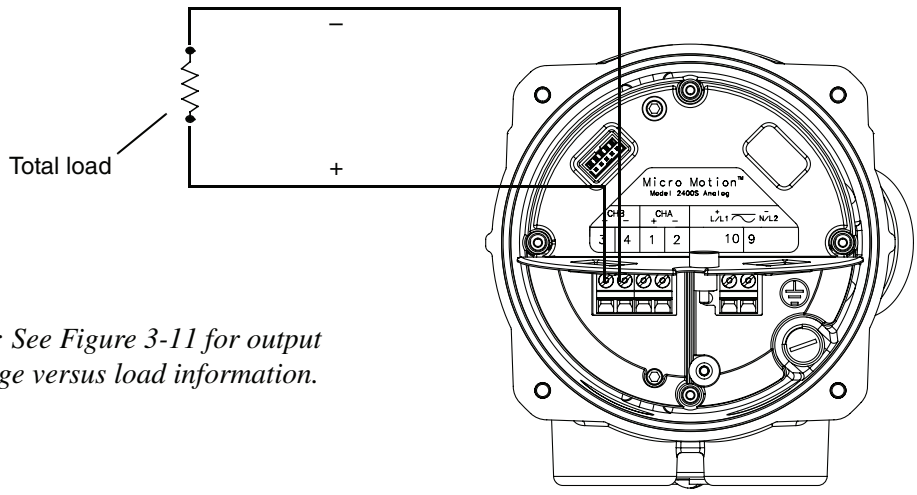
Do not exceed 36 VDC input. Terminal current must be less than 500 mA.

3.4.3 Discrete output wiring

Discrete output wiring depends on whether you will use internal or external power. The following diagrams are examples of proper wiring for these configurations:

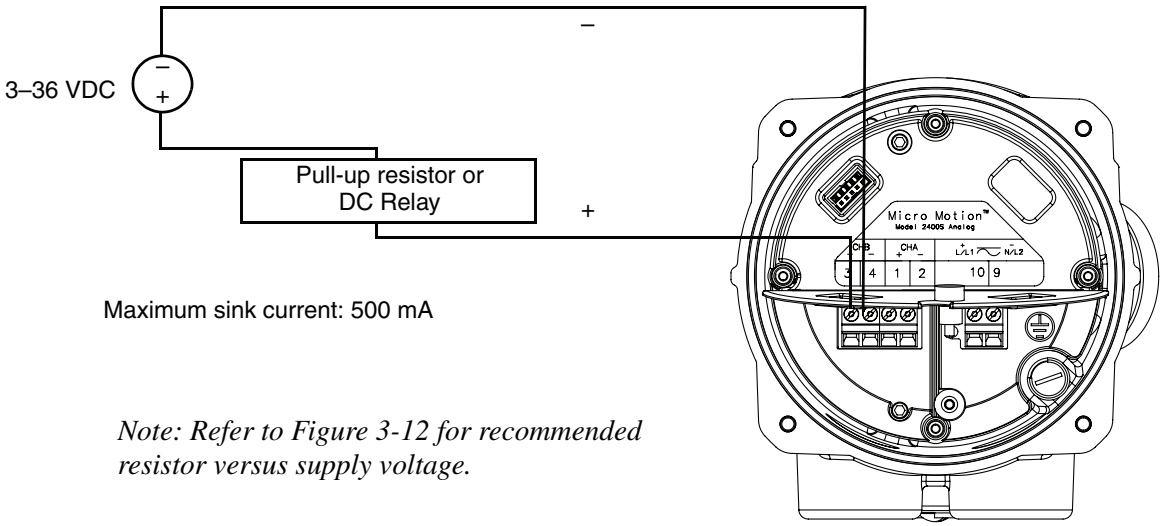
- Internal power – Figure 3-9
- External power – Figure 3-10

Figure 3-9 Discrete output wiring – Internal power



Note: See Figure 3-11 for output voltage versus load information.

Figure 3-10 Discrete output wiring – External power



Maximum sink current: 500 mA

Note: Refer to Figure 3-12 for recommended resistor versus supply voltage.

⚠ CAUTION

Excessive current will damage the transmitter.

Do not exceed 36 VDC input. Terminal current must be less than 500 mA.

Figure 3-11 Output voltage vs. load resistance – Internal power

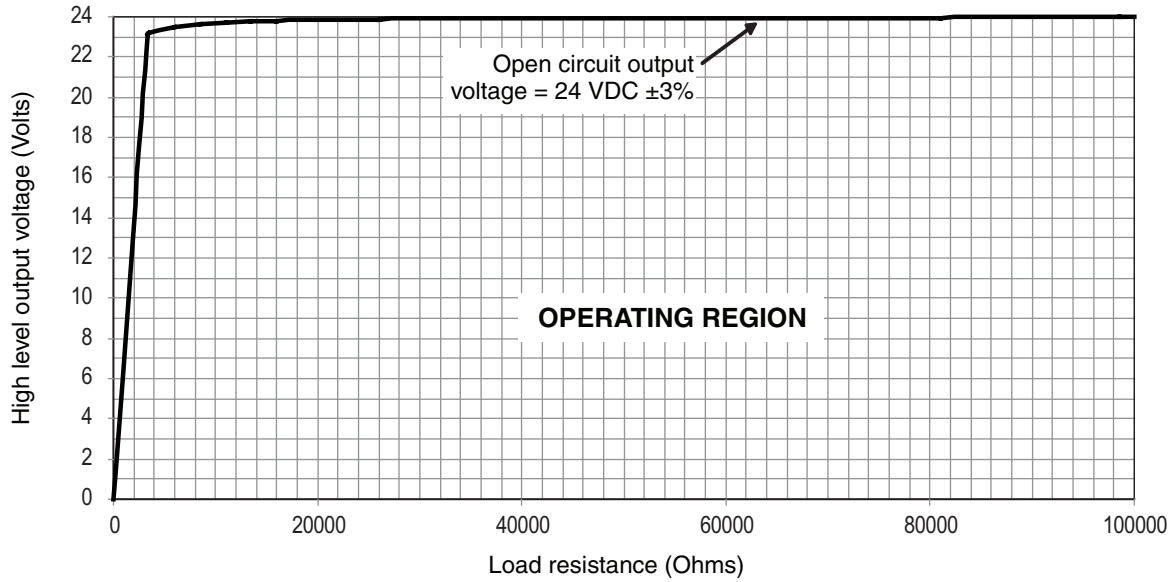
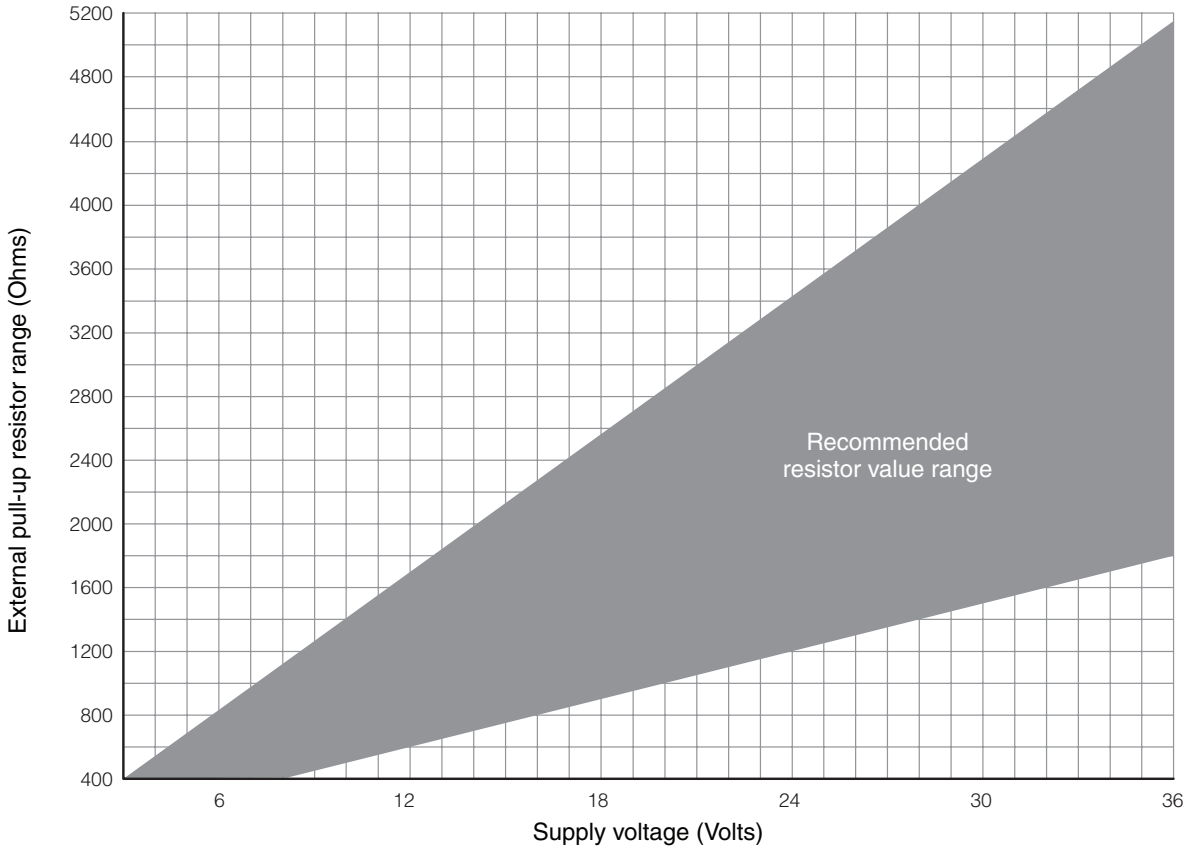


Figure 3-12 Recommended pull-up resistor versus supply voltage – External power



Note: When using a discrete output to drive a relay, choose external pull-up to limit current to less than 500 mA.

3.4.4 Discrete input wiring

Discrete input wiring depends on whether you will use internal or external power. The following diagrams are examples of proper wiring for these configurations:

- Internal power – Figure 3-13
- External power – Figure 3-14

If external power is configured, power may be supplied by a PLC or other device, or by direct DC input. See Table 3-2 for input voltage ranges.

Table 3-2 Input voltage ranges for external power

VDC	Range
3–36	High level
0–0.8	Low level
0.8–3	Undefined

Figure 3-13 Discrete input wiring – Internal power

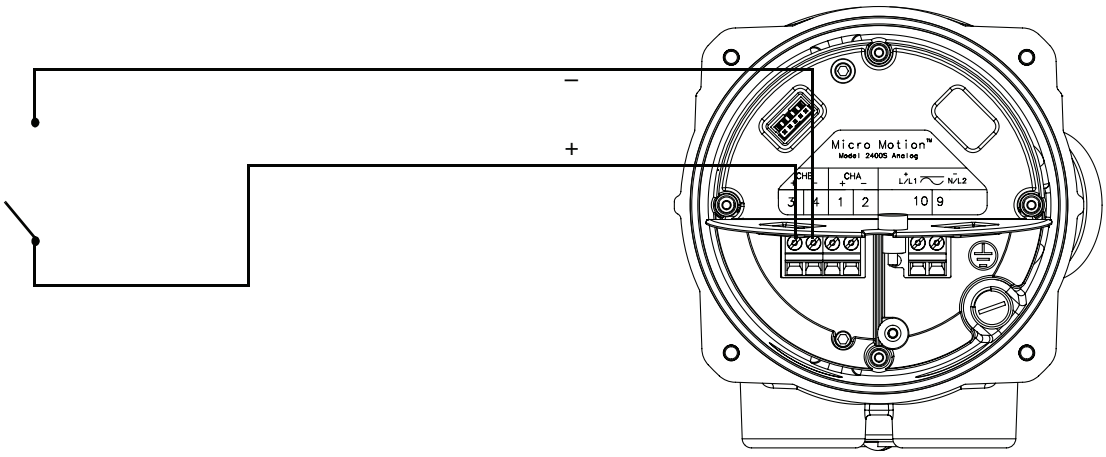
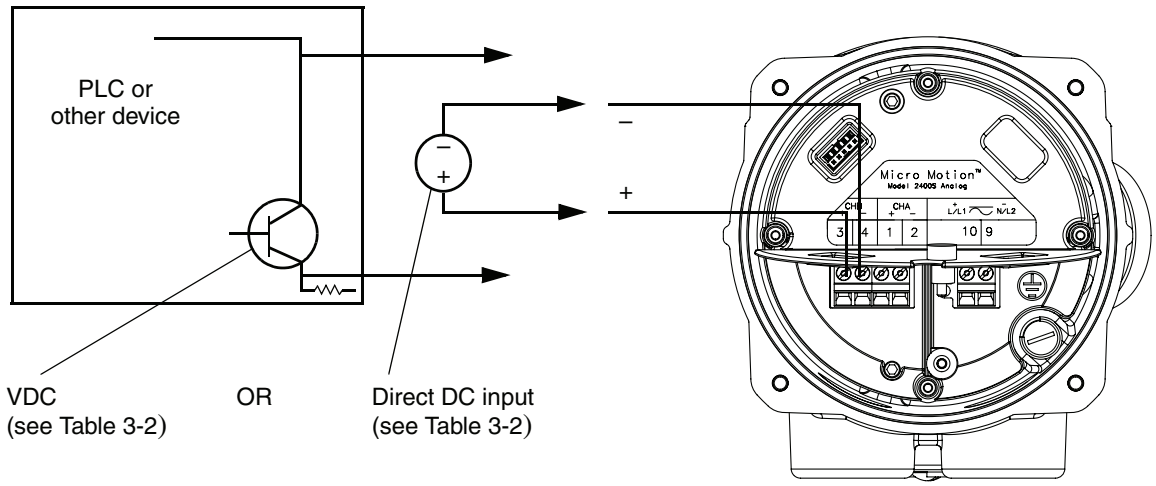


Figure 3-14 Discrete input wiring – External power



3.5 Wiring the outputs (Zone 1 Exi)

The following notes and diagrams are intended to be used as a guide for installing the 2400S Analog transmitter with Zone 1 Exi approval.

⚠ WARNING

Hazardous voltage can cause severe injury or death.

To avoid the risk of hazardous voltage, shut off the power before wiring the transmitter outputs.

⚠ WARNING

A transmitter that has been improperly wired or installed in a hazardous area could cause an explosion.

To avoid the risk of an explosion:

- Make sure the transmitter is wired to meet or exceed local code requirements.
- Install the transmitter in an environment that complies with the classification tag on the transmitter. See Appendix A.

3.5.1 Hazardous area safety

The proper barrier selection will depend on what output is desired, which approval is applicable, and many installation-specific parameters. The information that is provided about IS barrier selection is intended as an overview. Refer to barrier manufacturers for more detailed information regarding the use of their products. Application-specific questions should be addressed to the barrier manufacturer or to Micro Motion.

Table 3-3 Safety parameters

	Value	
Parameter	**4–20 mA output**	**Frequency/discrete output**
Voltage (U_i)	36 V	36 V
Current (I_i)	500 mA	500 mA
Power (P_i)	1.5 W	1.5 W
Capacitance (C_i)	1.1 nF	1.1 nF
Inductance (L_i)	0.0 mH	0.0 mH

Hazardous area voltage

The Model 2400S transmitter's safety parameters require the selected barrier's open-circuit voltage to be limited to less than 36 VDC (V_{max} = 36 VDC). This voltage is the combination of the maximum safety barrier voltage (typically 28 VDC) plus an additional 2 VDC for HART communications when communicating in the hazardous area.

Hazardous area current

The Model 2400S transmitter's safety parameters require the selected barrier's short-circuit currents to sum to less than 500 mA (I_{max} = 500 mA) for the milliamp outputs and 500 mA (I_{max} = 500 mA) for the frequency/discrete output.

Hazardous area capacitance

The capacitance (C_i) of the Model 2400S transmitter is 1.1 nF. This value added to the wire capacitance (C_{cable}) must be lower than the maximum allowable capacitance (C_a) specified by the IS barrier. Use the following equation to calculate the maximum length of the cable between the transmitter and the barrier:

$$C_i + C_{cable} \leq C_a$$

Hazardous area inductance

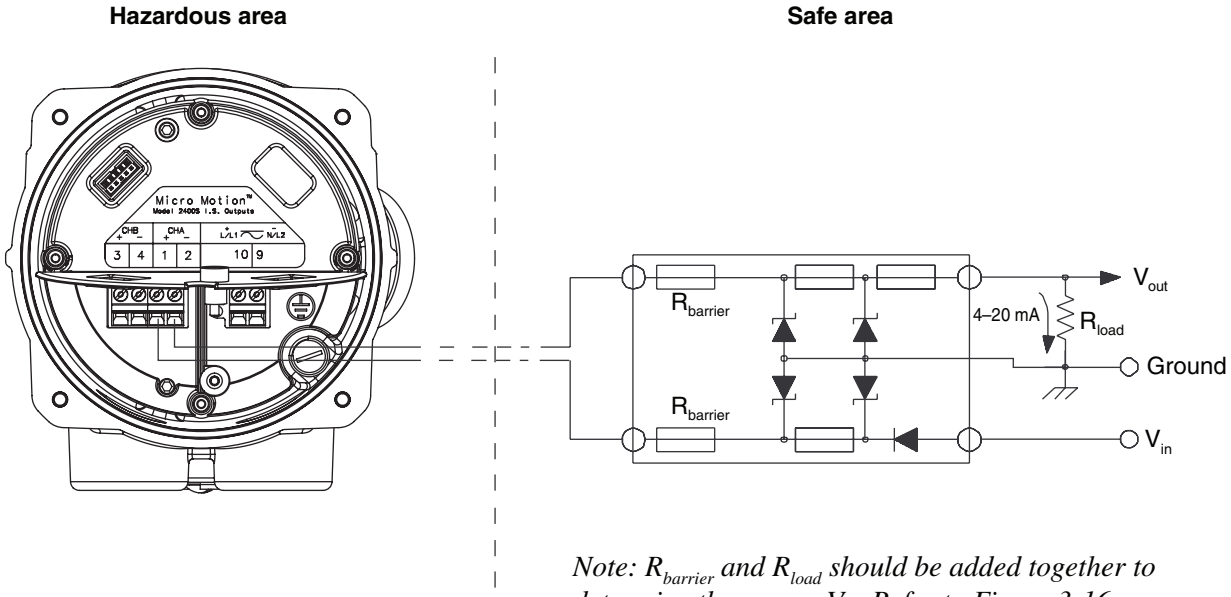
The inductance (Li) of the Model 2400S transmitter is 0.0 mH. This value plus the field wiring inductance (Lcable) must be lower than the maximum allowable inductance (L_a) specified by the IS barrier. The following equation can then be used to calculate the maximum cable length between the transmitter and the barrier:

$$L_i + L_{cable} \leq L_a$$

3.5.2 Hazardous area mA wiring

Figure 3-15 illustrates the basic hazardous area wiring for the Model 2400S Analog transmitter's mA output.

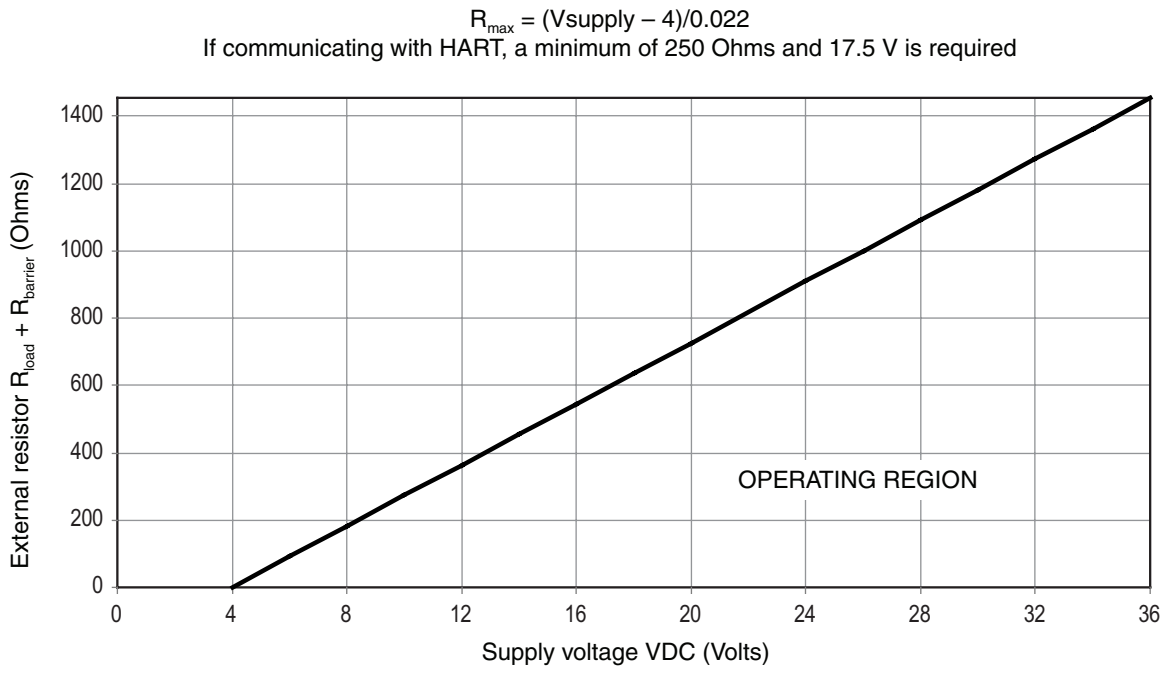
Figure 3-15 Hazardous area mA output wiring



Note: $R_{barrier}$ and R_{load} should be added together to determine the proper V_{in}. Refer to Figure 3-16.

Note: Channel B (terminals 3 and 4) can also be configured this way.

Figure 3-16 Safe area mA output load resistance values



3.5.3 Hazardous area frequency/discrete output wiring

The following frequency/discrete output wiring diagrams are examples of proper hazardous area wiring for the transmitter's frequency/discrete output:

- The diagram in Figure 3-17 utilizes a galvanic isolator that has an internal 1000 Ohm resistor used for sensing current:
  - ON > 2.1 mA
  - OFF < 1.2 mA
- The diagram in Figure 3-18 utilizes a barrier with external load resistance.

Figure 3-17 Hazardous area frequency/discrete output wiring using galvanic isolator

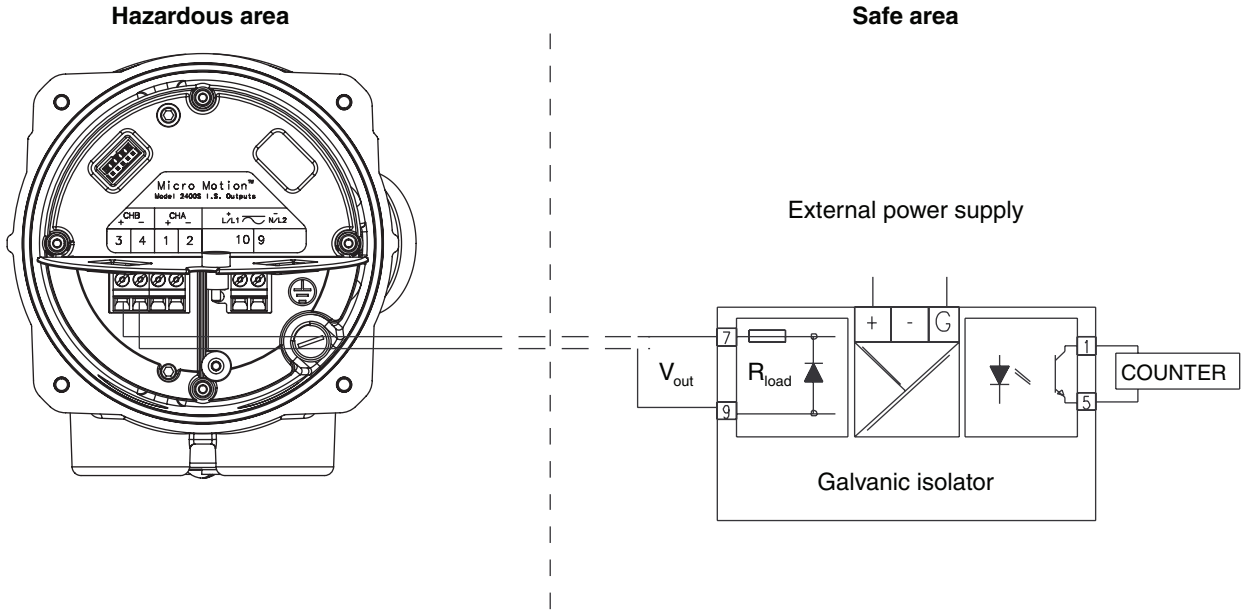
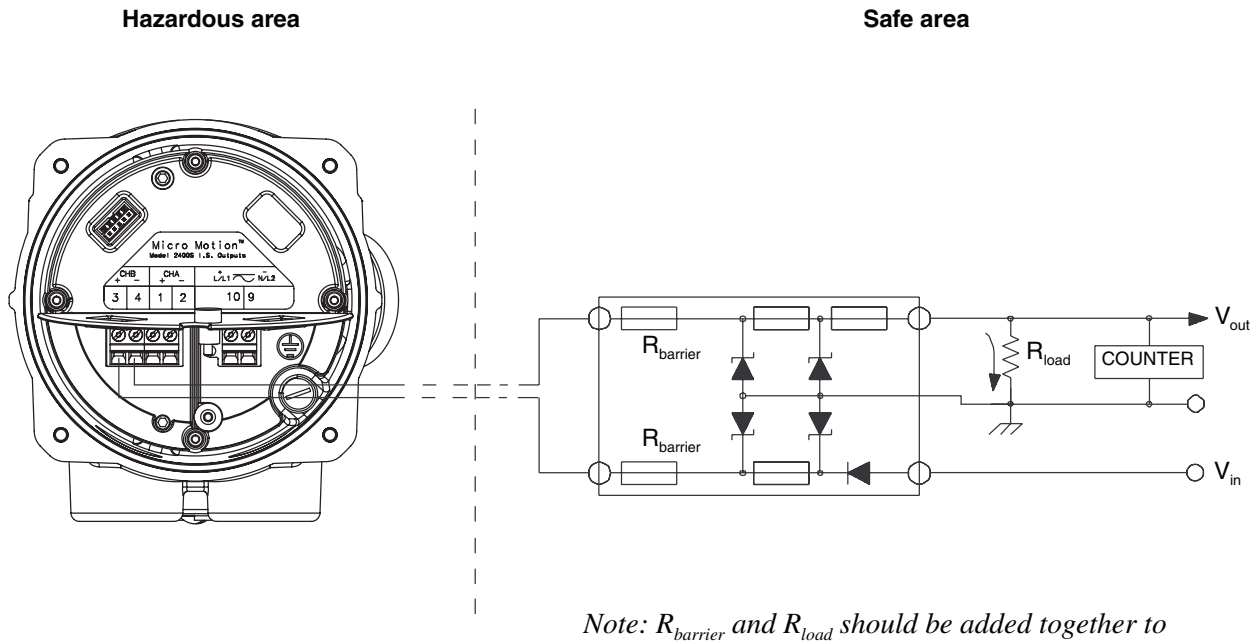
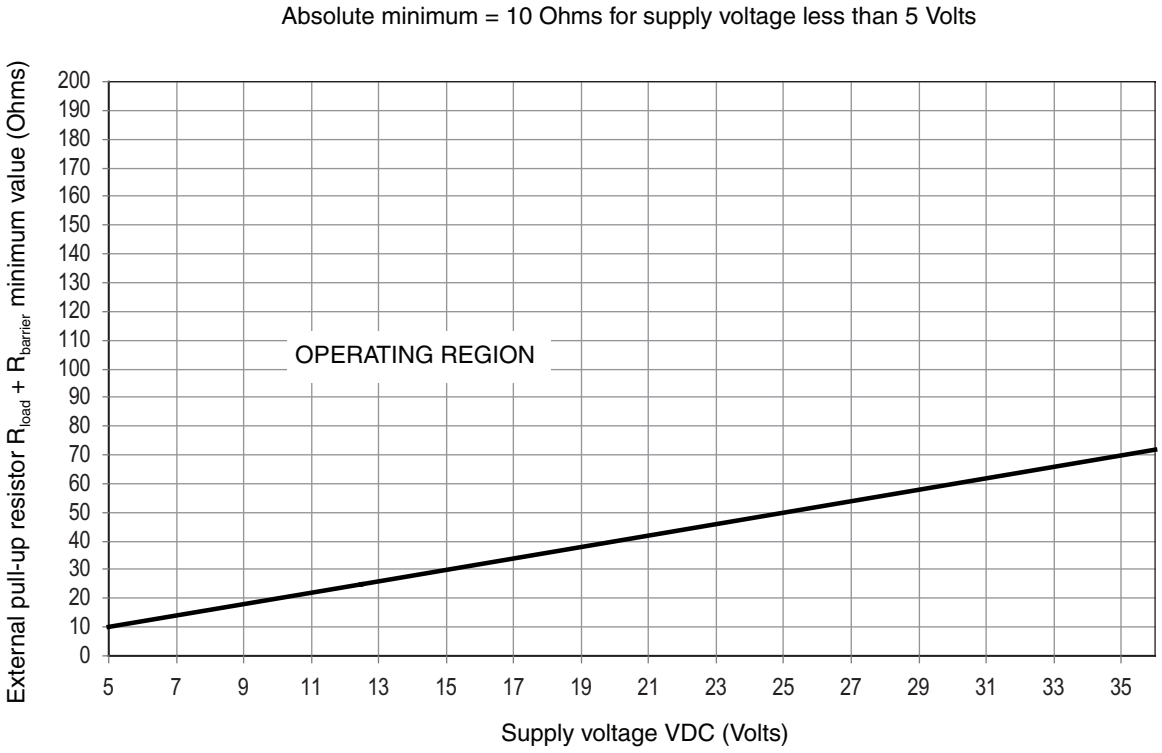


Figure 3-18 Hazardous area frequency/discrete output wiring using barrier with external load resistance



Note: $R_{barrier}$ and R_{load} should be added together to determine the proper V_{in}. Refer to Figure 3-19.

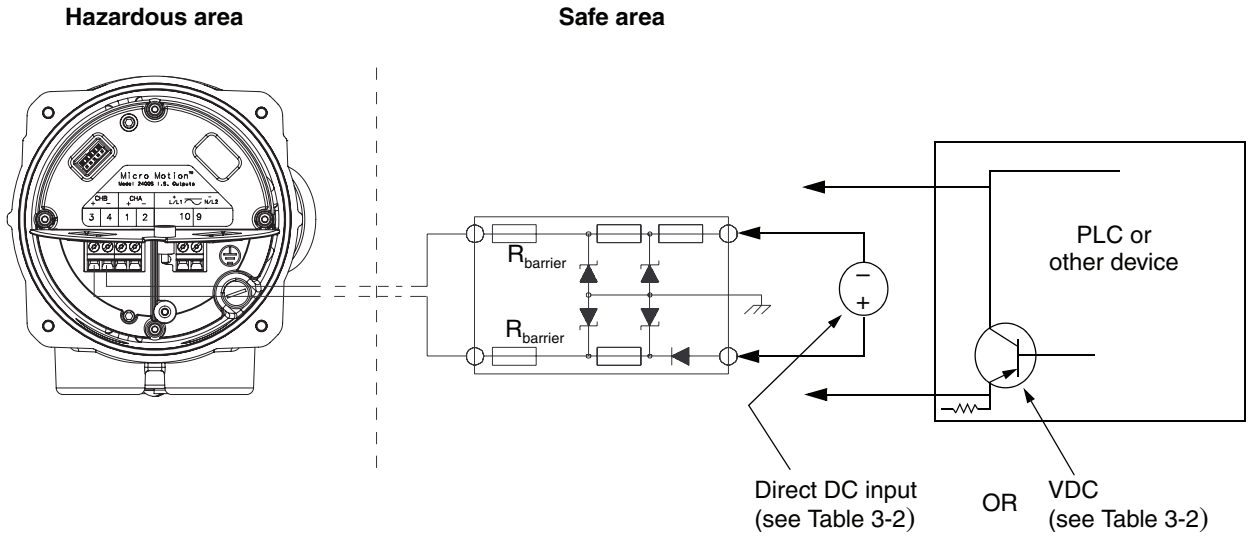
Figure 3-19 Safe area frequency/discrete output load resistance values



3.5.4 Hazardous area discrete input wiring

The following discrete input wiring diagram is an example of proper hazardous area wiring for the transmitter's discrete input.

Figure 3-20



Chapter 4
I/O Wiring – Model 2400S PROFIBUS-DP and DeviceNet Transmitters

4.1 Overview

This chapter describes how to wire I/O for Model 2400S PROFIBUS-DP and DeviceNet transmitters.

Note: To wire I/O for Model 2400S Analog transmitters, see Chapter 3.

It is the user's responsibility to verify that the specific installation meets the local and national safety requirements and electrical codes.

4.2 Moisture protection

When rotating or wiring the transmitter, guard against condensation or excessive moisture inside the transmitter housing. Be sure that the conduit openings are completely sealed after all installation and wiring procedures have been performed.

⚠ CAUTION

Condensation or excessive moisture entering the transmitter could damage the transmitter and result in measurement error or flowmeter failure.

To reduce the risk of measurement error or flowmeter failure:

- Do not mount the sensor so that the conduit openings on the transmitter point upward.
- Ensure the integrity of gaskets and O-rings.
- Grease the O-rings every time the transmitter housing is opened and closed.
- Install drip legs on conduit or cable.
- Seal the conduit openings.
- Fully tighten all covers.

4.3 I/O wiring for Model 2400S PROFIBUS-DP transmitters

To connect the I/O wiring for a 2400S PROFIBUS-DP transmitter:

1. Remove the user interface cover and user interface module. See Section 2.4 for instructions.
2. Wire the transmitter to the PROFIBUS-DP segment according to the diagram in Figure 4-1. Follow all local safety regulations.
3. Replace the user interface module and user interface cover.

Note: It is not necessary to open the power compartment to wire the outputs. Do not open the power compartment unless you are also wiring the power supply.

Note: The PROFIBUS cable shield is required to be grounded at both ends. At the 2400S, ground the cable shield in an appropriate cable gland. If an optional PROFIBUS-DP Eurofast M12 connector is used, the cable shield is grounded via the threads of the connector.

⚠ WARNING

Hazardous voltage can cause severe injury or death.

To avoid the risk of hazardous voltage, shut off the power before wiring the transmitter outputs.

⚠ WARNING

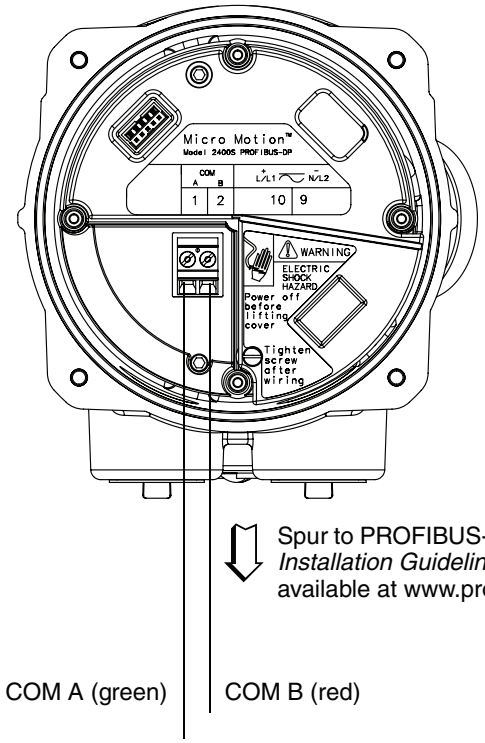
A transmitter that has been improperly wired or installed in a hazardous area could cause an explosion.

To avoid the risk of an explosion:

- Make sure the transmitter is wired to meet or exceed local code requirements.
- Install the transmitter in an environment that complies with the classification tag on the transmitter. See Appendix A.

Figure 4-1 Model 2400S PROFIBUS-DP I/O wiring

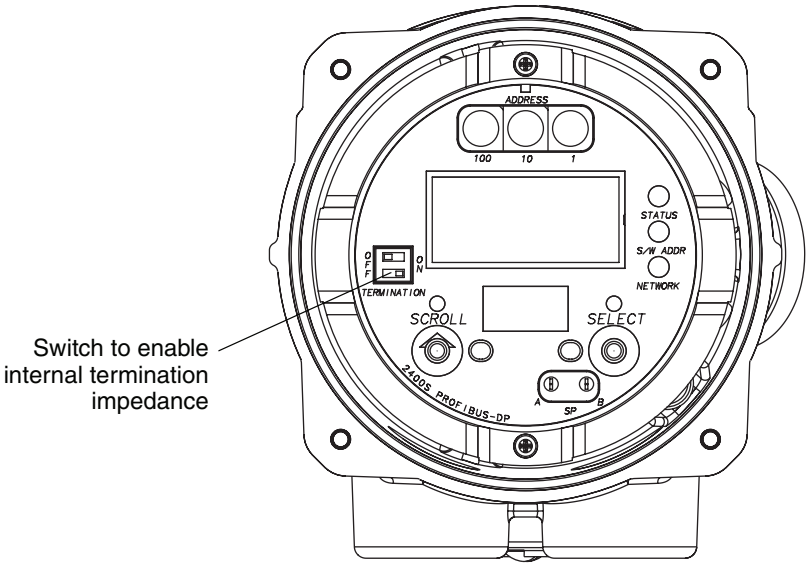
Note: The Model 2400S PROFIBUS-DP transmitter does not have terminals for termination wiring. An external terminator is not required. The transmitter has an internal terminator. There is a switch on the user interface for enabling internal termination. See Section 4.3.1.



4.3.1 Enabling internal termination

Model 2400S PROFIBUS-DP transmitters have a switch on the user interface module to enable internal termination impedance. Refer to Figure 4-2.

Figure 4-2 Model 2400S PROFIBUS-DP internal termination impedance switch



4.4 I/O wiring for Model 2400S DeviceNet transmitters

Connect the transmitter to the DeviceNet segment according to the diagram in Figure 4-3. The transmitter is shipped with a DeviceNet male sealed Micro Connector (Eurofast) that has been preinstalled and wired according to the DeviceNet specification.

Follow all local safety regulations.

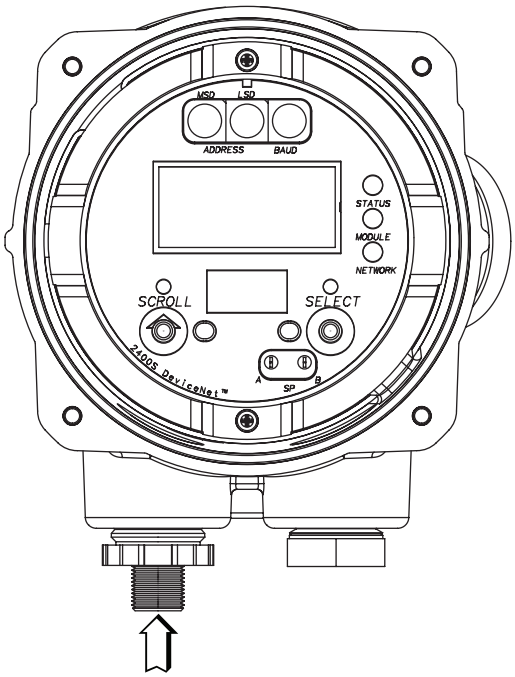
⚠ WARNING

A transmitter that has been improperly wired or installed in a hazardous area could cause an explosion.

To avoid the risk of an explosion:

- Make sure the transmitter is wired to meet or exceed local code requirements.
- Install the transmitter in an environment that complies with the classification tag on the transmitter. See Appendix A.

Figure 4-3 Model 2400S DeviceNet I/O wiring



Attach a 5-pin female
Eurofast connector here

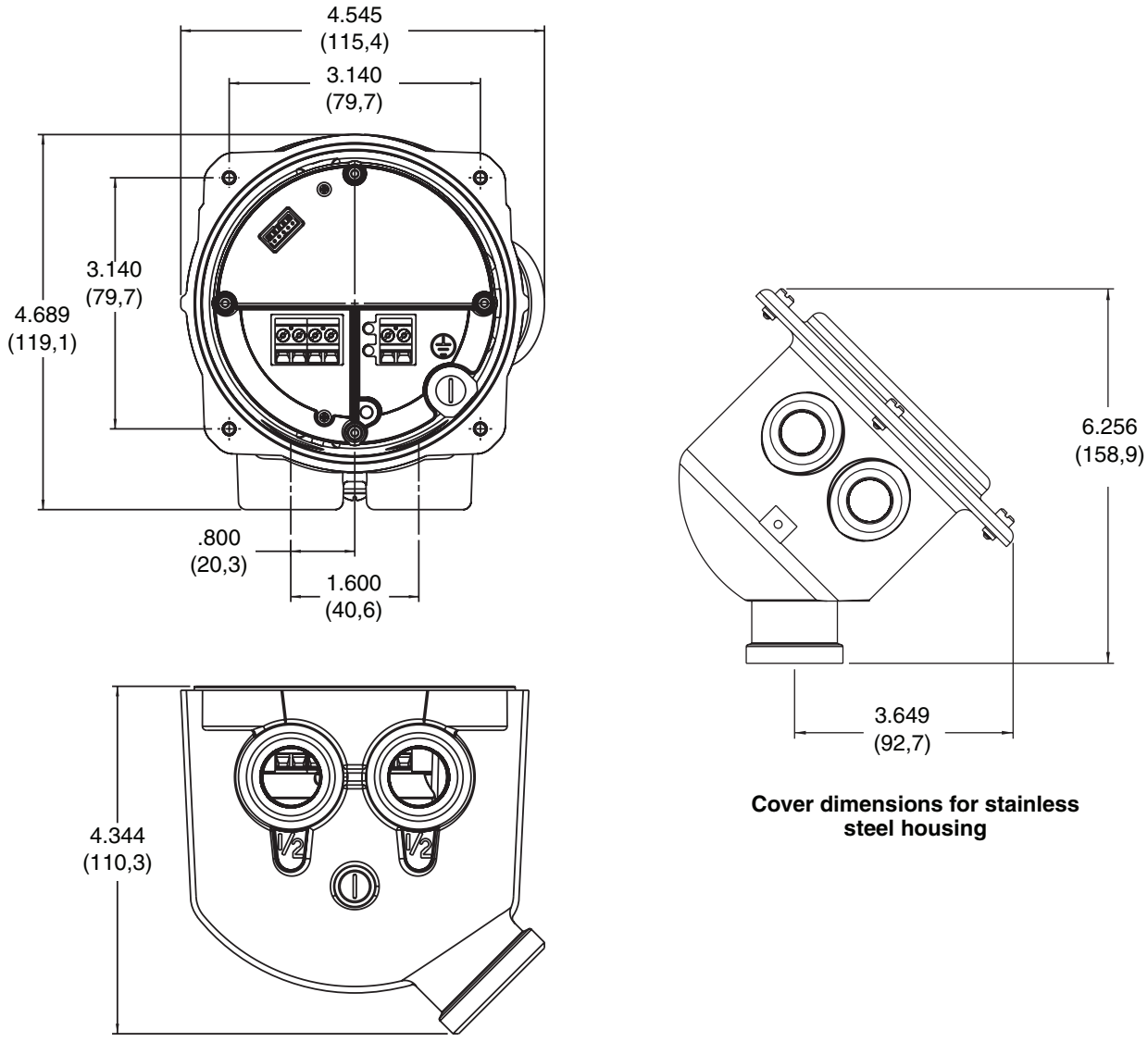
Appendix A
Dimensions and Specifications

A.1 Dimensions

Figure A-1 shows the dimensions of the Model 2400S transmitter. For sensor dimensions, see the sensor data sheet.

Figure A-1 Transmitter dimensions

Dimensions in inches (mm)



Cover dimensions for stainless steel housing

A.2 Physical specifications

Housing	Polyurethane-painted aluminum Optional: 304L stainless steel with surface finish of 32 RA
Weight	Transmitter is mounted integrally with sensor. For weight of flowmeter, see product data sheet for sensor.
Mounting and cabling	Model 2400S transmitters are mounted integrally with sensor. The transmitter can be rotated on the sensor up to 360° in 45° increments.

A.3 Power supply – Models 2400S Analog and PROFIBUS-DP

Self-switching AC/DC input, automatically recognizes supply voltage. Complies with low voltage directive 73/23/EEC per IEC 61010-1. Installation (Overvoltage) Category II, Pollution Degree 2.	
AC	• 85–265 VAC • 50/60 Hz • 4 watts typical, 7 watts maximum
DC	• 18–100 VDC • 4 watts typical, 7 watts maximum
Fuse	IEC 127-1.25 fuse, slow blow

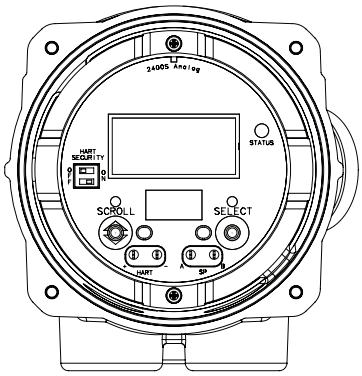
A.4 Electrical connections

Model 2400S Analog	
Input and output connections	Two pairs of wiring terminals for transmitter inputs/outputs. Screw terminals accept solid or stranded conductors, 26 to 14 AWG (0,14 to 2,5 mm^2).
Power connections	One pair of wiring terminals accepts AC or DC power. One internal ground lug for power supply ground wiring. Screw terminals accept solid or stranded conductors, 26 to 14 AWG (0,14 to 2,5 mm^2).
Digital comm maintenance connections	Two clips for temporary connection to the service port. Two clips for temporary connection to HART/Bell 202 terminals.
Model 2400S PROFIBUS-DP	
PROFIBUS-DP segment	One pair of wiring terminals for connection to PROFIBUS-DP segment. Connection type: • Screw terminals accept solid or stranded conductors, 26 to 14 AWG (0,14 to 2,5 mm^2). • Five-pin PROFIBUS-DP M12 (Eurofast) female connector (optional).
Power connections	One pair of wiring terminals accepts AC or DC power. One internal ground lug for power supply ground wiring. Screw terminals accept solid or stranded conductors, 26 to 14 AWG (0,14 to 2,5 mm^2).
Digital comm maintenance connections	Two clips for temporary connection to the service port.
Model 2400S DeviceNet	
DeviceNet segment	One pre-installed male 5-pin Eurofast connector for I/O and power supply wiring
Digital comm maintenance connections	Two clips for temporary connection to the service port.

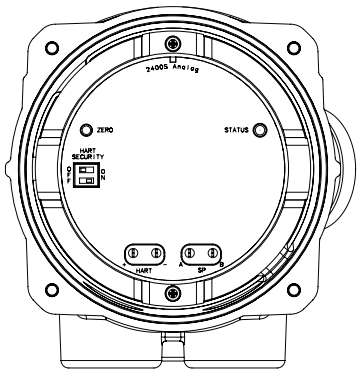
A.5 User interface

Model 2400S Analog

With display

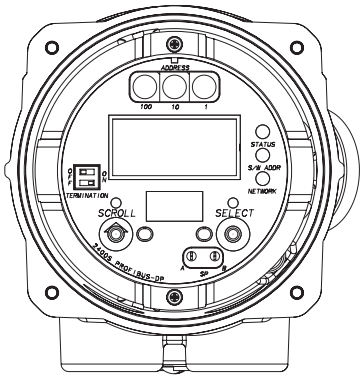


Without display

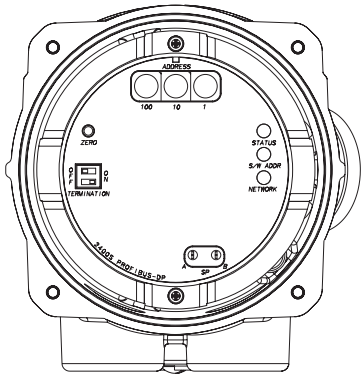


Model 2400S PROFIBUS-DP

With display

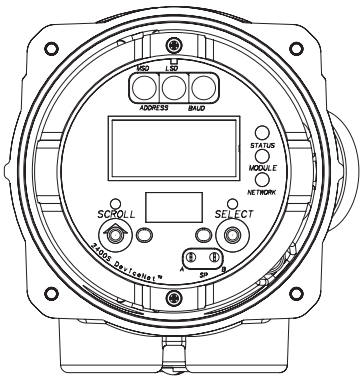


Without display

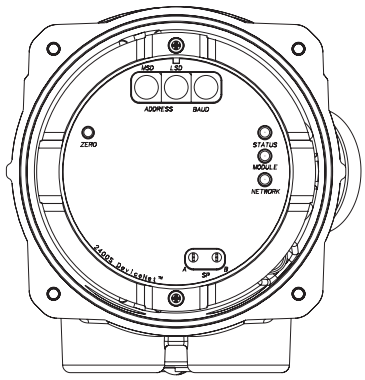


Model 2400S DeviceNet

With display



Without display



Interface functions	
All models with or without display	• Suitable for hazardous area installation. • User interface module can rotate 360° on the transmitter in 90° increments. • Three-color status LED on user interface module indicates flowmeter condition at a glance, using a solid green, yellow, or red light. Zero in progress is indicated by a flashing yellow light. • Two clips for service port connections (requires removing transmitter housing cover).
Model 2400S Analog with or without display	• Two clips for HART/Bell 202 connections (requires removing transmitter housing cover). • HART security switch (requires removing transmitter housing cover).
Model 2400S DeviceNet, with or without display	• Three rotary switches for selecting network address and baud rate (network address and baud rate are also software selectable). • Module and network LEDs to indicate DeviceNet status.
Model 2400S PROFIBUS-DP, with or without display	• Three rotary switches for selecting network address (network address is also software selectable). • DIP switch for enabling internal termination resistor. • Address and network LEDs that indicate PROFIBUS-DP status.
All models with display	• Depending on purchase option, transmitter housing cover has glass or plastic lens. • User interface module includes LCD panel. LCD line 1 displays process variable; line 2 displays engineering unit of measure. • Display update rate is user-configurable: 1 to 10 seconds at 1-second increments. • Display backlighting may be adjusted or turned off. • Operator access to transmitter menus is provided via optical switches that are operated through the lens. LED indicators show when a “button” has been pressed. • Infrared port allows access to service port from IrDA device (e.g., PDA running Pocket ProLink) without removing transmitter housing cover.
All models without display	• Transmitter housing cover is all metal (no lens). • Access to user interface requires removing transmitter housing cover. • Zero button allows flowmeter zero from field (requires removing transmitter housing cover). • No IrDA.

A.6 Input/output signals

Model 2400S Analog (Zone 1 Exe or Zone 2)	
Channel A	One active or passive 4–20 mA output • Not intrinsically safe • Isolated to ±50 VDC from all other outputs and earth ground • Maximum load limit: 820 ohms • Can report mass flow, volume flow, density, temperature, or drive gain • Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)
Channel B (configurable)	One active or passive 4–20 mA output • Not intrinsically safe • Isolated to ±50 VDC from all other outputs and earth ground • Maximum load limit: 820 ohms • Can report mass flow, volume flow, density, temperature, or drive gain • Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)
	One active or passive frequency/pulse output • Not intrinsically safe • Can report mass flow or volume flow, which can be used to indicate flow rate or total • Scalable to 10,000 Hz • Power: - Internal (active): +24 VDC ±3% with a 2.2 kohm internal pull-up resistor - External (passive): +36 VDC maximum, +24 VDC typical • Output is linear with flow rate to 12,500 Hz
	One active or passive discrete output • Not intrinsically safe • Can report five discrete events, flow switch, forward/reverse flow, calibration in progress, or fault • Power: - Internal (active): +24 VDC ±3% with a 2.2 kohm internal pull-up resistor - External (passive): +36 VDC maximum, +24 VDC typical • Maximum sink capability: 500 mA
	One active or passive discrete input • Not intrinsically safe • Power: - Internal (active): +24 VDC, 10 mA maximum source current - External (passive): +3 to 36 VDC maximum • Can reset all totals, reset mass total, reset volume total, or start sensor zero

Model 2400S Analog (Zone 1 Exi)

Channel A

One passive 4–20 mA output
- Intrinsically safe
- Isolated to ±50 VDC from all other outputs and earth ground
- Maximum load limit: 820 ohms
- Can report mass flow, volume flow, density, temperature, or drive gain
- Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)

Channel B (configurable)

One passive 4–20 mA output
- Intrinsically safe
- Isolated to ±50 VDC from all other outputs and earth ground
- Maximum load limit: 820 ohms
- Can report mass flow, volume flow, density, temperature, or drive gain
- Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)

One passive frequency/pulse output
- Intrinsically safe
- Can report mass flow or volume flow, which can be used to indicate flow rate or total
- Scalable to 10,000 Hz
- Power: External (passive): +36 VDC maximum, +24 VDC typical
- Output is linear with flow rate to 12,500 Hz

One passive discrete output
- Intrinsically safe
- Can report five discrete events, flow switch, forward/reverse flow, calibration in progress, or fault
- Power: External (passive): +36 VDC maximum, +24 VDC typical
- Maximum sink capability: 500 mA

One passive discrete input
- Intrinsically safe
- Power: External (passive): +3 to 36 VDC maximum
- Can reset all totals, reset mass total, reset volume total, or start sensor zero

Entity parameters

	Value	
Parameter	4–20 mA output	Frequency/ discrete output
Voltage (U_i)	36 V	36 V
Current (I_i)	500 mA	500 mA
Power (P_i)	1.5 W	1.5 W
Capacitance (C_i)	1.1 nF	1.1 nF
Inductance (L_i)	0.0 mH	0.0 mH

Model 2400S PROFIBUS-DP

Digital 2-way PROFIBUS-DP signal.
Certified by PNO.

Model 2400S DeviceNet

Digital 2-way DeviceNet signal.
Certified by ODVA.

A.7 Digital communications

All versions	
Service port	One service port for temporary connections (requires removing transmitter housing cover) Uses RS-485 Modbus signal, 38.4 kBaud, one stop bit, no parity Address: 111 (not configurable)
Wireless	If transmitter has display, service port can be accessed with IrDA device (for example, a PDA running Pocket ProLink) without removing transmitter housing cover. If transmitter has no display, access to service port requires removing transmitter housing cover.
Model 2400S Analog	
HART/Bell 202	HART signal is superimposed on the primary milliamp output (Channel A), and is available for host system interface: • Frequency: 1.2 and 2.2 kHz • Amplitude: to 1.0 mA • 1200 baud, one stop bit, odd parity • Address: 0 (default), configurable • Requires 250 to 600 Ω resistance
Model 2400S PROFIBUS-DP	
PROFIBUS-DP	Digital 2-way communication protocol • Automatically recognizes network baud rate • Address selectable by 3 rotary switches, or software selectable
Model 2400S DeviceNet	
DeviceNet	Digital 2-way communication protocol • Address and baud rate selectable by 3 rotary switches (2 to select address, 1 to select baud rate), or software selectable

A.8 Host interface

Model 2400S Analog	ProLink® II v2.5 from Micro Motion supports full device configuration. HART DD file supports all functionality.
Model 2400S PROFIBUS-DP	ProLink II v2.5 from Micro Motion supports full device configuration. • GSD file conforming to the PROFIBUS-DP specification: - Provides Profibus Class 1 Master functions - Enables reading and controlling all process data • DD file conforming to Profibus EDDL specification - Provides Profibus Class 2 Master functions - Enables device configuration - Supports Siemens Simatic PDM
Model 2400S DeviceNet	ProLink II v2.5 from Micro Motion supports full device configuration. • EDS file conforming to the DeviceNet specification: - Enables device configuration

A.9 Environmental limits

Ambient temperature limits	Operating and storage: –40 to +140 °F (–40 to +60 °C) Below –4 °F (–20 °C), LCD responsiveness decreases and LCD may become difficult to read. Above 131 °F (55 °C), some darkening of the LCD panel might occur. ATEX requires limiting ambient temperature to below 131 °F (55 °C).
Humidity limits	5 to 95% relative humidity, non-condensing at 140 °F (60 °C)
Vibration limits	Meets IEC68.2.6, endurance sweep, 5 to 2000 Hz, 50 sweep cycles at 1.0 g

A.10 Environmental effects

All models	
EMI effects	Meets EMC directive 89/336/EEC per EN 61326 Industrial Conforms to NAMUR NE21 Version: 10.02.2004
Model 2400S Analog only	
Ambient temperature effect	On mA output: ±0.005% of span per °C

A.11 Hazardous area classifications

All models			
CSA[1] C-US			Class I Division 2 Groups A, B, C, D Class II Division 2 Groups F and G
ATEX[2]	Zone 1 Analog	CE Ex	II 2GD EEx mb e ib IIC T4
	Zone 2 Analog or PROFIBUS-DP	CE Ex	II 3G EEx n A C II T5 II 3D IP66/IP67 T70°C
	Zone 2 DeviceNet	CE Ex	II 3G Ex nA II T5 II 3D IP66/IP67 T70°C

(1) CSA is a Canadian approvals agency that provides approvals accepted both in the U.S.A. and in Canada.
(2) ATEX is a European directive.

Appendix B
Return Policy

Micro Motion procedures must be followed when returning equipment. These procedures ensure legal compliance with government transportation agencies and help provide a safe working environment for Micro Motion employees. Failure to follow Micro Motion procedures will result in your equipment being refused delivery.

Information on return procedures and forms is available on our web support system at **www.micromotion.com**, or by phoning the Micro Motion Customer Service department.

B.1 New and unused equipment

Only equipment that has not been removed from the original shipping package will be considered new and unused. New and unused equipment requires a completed Return Materials Authorization form.

B.2 Used equipment

All equipment that is not classified as new and unused is considered used. This equipment must be completely decontaminated and cleaned before being returned.

Used equipment must be accompanied by a completed Return Materials Authorization form and a Decontamination Statement for all process fluids that have been in contact with the equipment. If a Decontamination Statement cannot be completed (e.g., for food-grade process fluids), you must include a statement certifying decontamination and documenting all foreign substances that have come in contact with the equipment.

Index

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